AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A method for forming a passivated metal layer in a gate stack of an integrated circuit, the method comprising:

providing a semiconductor substrate in a process chamber of a processing system wherein the substrate includes a high-k dielectric layer formed on an oxide, nitride, or oxynitride interface layer;

exposing the substrate to a process gas containing a rhenium-carbonyl precursor to deposit a rhenium metal layer on the ~~substrate~~ high-k dielectric layer in a thermal chemical vapor deposition process; and

forming a silicon-containing passivation layer or a carbon-containing passivation layer on the rhenium metal layer, wherein the passivation layer is effective to inhibit oxygen-induced growth of Re-containing nodules on a surface of the rhenium metal layer.

2-7. (Canceled)

8. (Currently Amended) A method for forming a passivated metal layer, the method comprising:

providing a substrate in a process chamber of a processing system;

exposing the substrate to a process gas containing a rhenium-carbonyl precursor to deposit a rhenium metal layer on the substrate in a thermal chemical vapor deposition process; and

exposing the rhenium metal layer to a gas containing silicon, carbon, ~~nitrogen,~~ oxygen, or boron, or a combination of two or more thereof, and annealing the substrate to diffuse the respective silicon, carbon, ~~nitrogen,~~ oxygen or boron into at least a surface portion of the rhenium metal layer to ~~form a~~ convert the surface portion to a respective rhenium silicide, rhenium carbide, rhenium oxide or rhenium boride

passivation layer effective to inhibit oxygen-induced growth of Re-containing nodules on a surface of the rhenium metal layer.

9. (Currently Amended) The method according to claim 8, wherein the gas comprises SiH_4, Si_2H_6, $SiCl_2H_2$, Si_2Cl_6, CH_4, C_2H_6, C_2H_4, C_2H_2, C_3H_6, C_2H_5OH, $CH_3CH_2CH_2OH$, CH_3COCH_3, C_4H_8O, ~~N_2, NH_3, NO, NO_2, N_2O,~~ O_2, BH_4 or B_2H_6, or a combination of two or more thereof.

10. (Currently Amended) A method for forming a passivated metal layer, the method comprising:

providing a substrate in a process chamber of a processing system;

exposing the substrate to a process gas containing a rhenium-carbonyl precursor to deposit a rhenium metal layer on the substrate in a thermal chemical vapor deposition process; and

forming a passivation layer on the rhenium metal layer by exposing the ~~substrate~~ rhenium metal layer to a metal-carbonyl precursor gas and a silicon-containing gas, a carbon-containing gas, an oxygen-containing gas, or a boron-containing gas, or a combination of two or more thereof, whereby the passivation layer is at least one of a metal silicide layer, a metal carbide layer, a metal oxide layer, or a metal boride layer, or a combination thereof, and wherein the passivation layer is effective to inhibit oxygen-induced growth of Re-containing nodules on a surface of the rhenium metal layer.

11. (Previously Presented) The method according to claim 10, wherein the metal-carbonyl precursor comprises $W(CO)_6$, $Ru_3(CO)_{12}$, $Ni(CO)_4$, $Mo(CO)_6$, $Co_2(CO)_8$, $Rh_4(CO)_{12}$, $Re_2(CO)_{10}$, $Os_3(CO)_{12}$, or $Cr(CO)_6$, or a combination of two or more thereof, the silicon-containing gas comprises SiH_4, Si_2H_6, $SiCl_2H_2$, Si_2Cl_6, or a combination of two or more thereof, the carbon-containing gas comprises CH_4, C_2H_6,

C_2H_4, C_2H_2, C_3H_6, C_2H_5OH, $CH_3CH_2CH_2OH$, CH_3COCH_3, or C_4H_8O, or a combination of two or more thereof, the oxygen-containing gas comprises O_2, and the boron-containing gas comprises BH_4 or B_2H_6, or both.

12. (Currently Amended) The method according to claim 1, further comprising annealing the silicon-containing passivation layer or the carbon-containing passivation layer to diffuse the silicon or carbon into at least a surface portion of the rhenium metal layer to ~~form~~ convert the surface portion to a rhenium silicide or rhenium carbide passivation layer.

13. (Previously Presented) The method according to claim 1, wherein the rhenium metal layer and the passivation layer are formed in the same processing system.

14. (Previously Presented) The method according to claim 1, wherein the rhenium metal layer and the passivation layer are formed in different processing systems.

15. (Previously Presented) A method for forming a passivated Re layer, the method comprising:

providing a substrate in a process chamber of a processing system;

exposing the substrate to a process gas containing a rhenium carbonyl precursor to deposit a Re layer on the substrate in a chemical vapor deposition process;

forming a tungsten passivation layer on the Re layer; and

forming a silicon passivation layer on the tungsten passivation layer, wherein the tungsten and silicon passivation layers are effective to inhibit oxygen-induced growth of Re-containing nodules on a surface of the Re layer.

16. (Previously Presented) The method according to claim 15, wherein the tungsten passivation layer is formed in a chemical vapor deposition process by exposing the Re layer to $W(CO)_6$.

17. (Previously Presented) The method according to claim 15, wherein the silicon passivation layer is formed in a chemical vapor deposition process by exposing the tungsten passivation layer to SiH_4, Si_2H_6, $SiCl_2H_2$, or Si_2Cl_6, or a combination of two or more thereof.

18. (Previously Presented) The method according to claim 15, wherein the Re layer and the tungsten and silicon passivation layers are formed in the same processing system.

19. (Previously Presented) The method according to claim 15, wherein the Re layer and the tungsten and silicon passivation layers are formed in different processing systems.

20. (Canceled)

21. (Previously Presented) The method according to claim 15, wherein the rhenium carbonyl precursor comprises $Re_2(CO)_{10}$.

22. (Previously Presented) The method according to claim 15, further comprising annealing the substrate to convert at least a portion of the tungsten and silicon passivation layers to a tungsten silicide passivation layer.

23. (Previously Presented) A method for forming a passivated metal layer, the method comprising:

providing a substrate in a process chamber of a processing system;

exposing the substrate to a process gas containing a rhenium-carbonyl precursor to deposit a rhenium metal layer on the substrate in a thermal chemical vapor deposition process; and

forming a passivation layer on the rhenium metal layer by:

first, forming a metal layer on the rhenium metal layer,

second, exposing the metal layer to a silicon-containing gas, a carbon-containing gas, a nitrogen-containing gas, an oxygen-containing gas, or a boron-containing gas, or a combination of two or more thereof, and

third, diffusing the silicon, carbon, nitrogen, oxygen and/or boron into the metal layer to convert the metal layer to a metal silicide, a metal carbide, a metal nitride, a metal oxide and/or a metal boride,

wherein the passivation layer is effective to inhibit oxygen-induced growth of Re-containing nodules on a surface of the rhenium metal layer.